NOTES

A DEVICE FOR CONTROLLING ELECTRICAL CIRCUITS BY RAINFALL RATE

In studies of natural rainfall or phenomena associated with it, research workers often wish to have measuring equipment or research apparatus controlled by rainfall or rainfall rate. This paper describes a device used in one such study to provide the means for such control.

Among the instruments and apparatus used in a field study of soil erosion at Urbana, Illinois, are a raindrop camera, a camera for photographing a manometer board, and a series of motor-driven runoff-sampling wheels.

It was desired that the electrical circuits carrying power to these several pieces of equipment be energized automatically when rainfall began and de-energized when rainfall ceased, with the added provisos that the raindrop camera not be operated during periods of rainfall of very low intensity, and that the other circuits continue to be energized for a specified period after the complete cessation of rainfall. These latter requirements were imposed so that camera film would not be wasted in photographing insignificant low-intensity drizzles, and to insure the operation of the runoff-sampling wheels until after runoff had ceased. In this instance these requirements were met with the device shown schematically in figure 1, which operates in the following fashion.

The minimum rainfall rate above which the electrical circuits will be energized by this control device is determined by the relationship between the size of the rain collector funnel and the size of the capillary drain tube in the electrode chamber. This can be adjusted to meet any specific research requirement.

When rain falls at a rate greater than this minimum, the electrodes become immersed in water, completing the normal (common) line to the coil of sensitive relay A. The use of this sensitive relay (Sigma 41FZ-10000-ACS-SIL, SPDT, 115 v. AC coil) obviates the use of an electrolyte in the electrode chamber. Through the normally open (NO) contact of relay A, the coil of power relay B (Potter-Brumfield PRIIAY, DPDT, 115 v. AC coil) is energized; then, through the NO contacts of relay B, the raindrop camera circuit is energized, and the solenoid reset clutch in time delay relay D (Paragon time delay relay, Model Z, Type 42, Pilot 3B, Reset 2) is energized, resetting this timer. Through a mechanical linkage, this allows the microswitch in time delay relay D to resume its closed position, supplying power to the coil of power relay C (same as B, but only one pair of contacts used) through a normally closed (NC) contact of the DPDT switch in D. When the coil of C is energized, the manometer camera and runoff sampling wheel circuits are energized.

When the rainfall rate falls below the minimum, or cutoff, intensity, the circuit to relay A is opened and power relay B is then open; the raindrop camera is thus stopped, but through an NC contact (B2) of relay B the timer motor in time delay relay D is started. The DPDT switch in the latter remains in its closed position until the timer motor has run for the preset time interval, maintaining the power supply to the coil of relay C until the end of that time.

Should rainfall resume at a rate greater than the cutoff intensity before the time delay has expired, the device will repeat its entire sequence of operations. Thus, the full time delay for the manometer camera and sampling wheel circuits is available whenever the rainfall does finally cease.—L. C. JOHNSON, Soil Scientist, and H. B. PUCKETT, Agricultural Engineer, Soil & Water Conservation Research Div., and Agricultural Engineering Div., ARS, USDA, Urbana, Ill.

*Trade names and company names are included for the benefit of the reader and do not imply any endorsement or preferential treatment of the named product by the U. S. Department of Agriculture or Illinois Agr. Exp. Sta.

Figure 1—Schematic diagram of electrical circuit control device, shown in de-energized condition.